DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS OFFICE
ENVIRONMENT, SAFETY AND HEALTH DIVISION
ENVIRONMENTAL PROGRAMS BRANCH

ENVIRONMENTAL ASSESSMENT PROGRAM

PHASE 2: ROCKY FLATS PLANT INSTALLATION GENERIC MONITORING PLAN

(Comprehensive Source and Plume Characterization Plan)

INTERIM QUALITY ASSURANCE/QUALITY CONTROL PLAN

DECEMBER 1988

DRAFT

INTERIM
QUALITY ASSURANCE/QUALITY CONTROL PLAN

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1. INTRODUCTION

Multi-media monitoring activities at Rocky Flats Plant are part of the Department of Energy's (DOE) Environmental Response (ER) Program. (The ER Program was formerly called the Comprehensive Environental Assessment and Response (CEARP)). The ER Program Phase 2 consists of ER Phase 2a, Monitoring Plan, and ER Phase 2b, Site Characterization (Remedial Investigation). This Quality Assurance/ Quality Control (QA/QC) Plan is one component of the Monitoring Plan for Rocky Flats Plant. The Monitoring Plan typically consists of five parts: Synopsis, Sampling Plan, Technical Data Management Plan, Health and Safety Plan, and Quality Assurance/Quality Control Plan. Because of the Compliance Agreement between the State of Colorado, Environmental Protection Agency, and the DOE, this Monitoring Plan also includes a Feasibility Study Plan. The Synopsis provides a discussion of the current situation and serves as an introduction to the other plans.

The ER Program uses a three-tiered approach in preparing the monitoring plans: the ER Generic Monitoring Plan (DOE, 1986), the Installation Generic Monitoring Plan (IGMP), and the Site-Specific Monitoring Plans (SSMPs). The ER Generic Monitoring Plan Quality Assurance/Quality Control (QA/QC) Plan provides the generic guidelines and procedures that will be employed during ER Phase 2 site characterization (remedial investigation) to ensure the reliability of data collected at ER Program sites. It is intended to establish a general quality assurance/quality control policy and to provide the framework for more specific quality assurance/quality control requirements to be employed at each installation and at each site. This IGMP Quality Assurance/Quality Control Plan provides installation generic information and procedures, whereas the SSMPs will provide site-specific detail regarding locations, types and number of samples.

This IGMP is the Comprehensive Source and Plume Characterization Plan required by the Compliance Agreement. Therefore, the acronym used to refer to this plan is IGMP/CSPCP.

According to DOE policy, DOE activities shall maintain programs of quality assurance (DOE Order 5700.6B). In the area of environmental protection, quality assurance plans must be integrated with the DOE implementation of CERCLA (DOE Order 5480.14).

ER Program Phase 2b site characterizations (remedial investigations) will be implemented using procedures to assure that the precision, accuracy, completeness, and representativeness of data are known and documented. At a minimum, this will include adherence to the ER Program Generic Monitoring Plan, IGMP/CSPCP, and SSMP Quality Assurance/Quality Control Plans, and may include preparation of written Quality Assurance/Quality Control Plans covering each aspect of the project performed.

This IGMP/CSPCP Quality Assurance/Quality Control Plan presents the organization, objectives, functional activities, and specific quality assurance and quality control activities associated with the ER Program Phase 2b site characterizations (remedial investigations) at Rocky Flats Plant. The Quality Assurance/Quality Control Plan is designed to achieve specific data quality goals for the ER Program Phase 2b site characterizations (remedial investigations).This plan is considered interim pending incorporation of ANSI/ASME NQA-1-1986 Standards.

A brief description of the ER Program Phase 2b site characterization (remedial investigation) and background can be found in the Synopsis. For a more in-depth background description, see the ER Program Phase 1 report.

2. ER PROGRAM PROJECT ORGANIZATION AND RESPONSIBILITY

Project organization and responsibility are divided among DOE, Los Alamos National Laboratory, and Rockwell International as described below. Los Alamos National Laboratory has the primary responsibility to implement THE ER Program under the guidance of DOE-Albuquerque Operations Office. However, operational responsibilities have been assigned to Rockwell International at Rocky Flats Plant for the site characterizations (remedial investigations). The DOE-Rocky Flats Plant Area Office is responsible for the function of the Rocky Flats Plant. Because of this responsibility, the DOE-Rocky Flats Plant Area Office will provide additional guidance to its contractor, Rockwell International, in implementation of the ER Program Phase 2b site characterizations (remedial investigations).

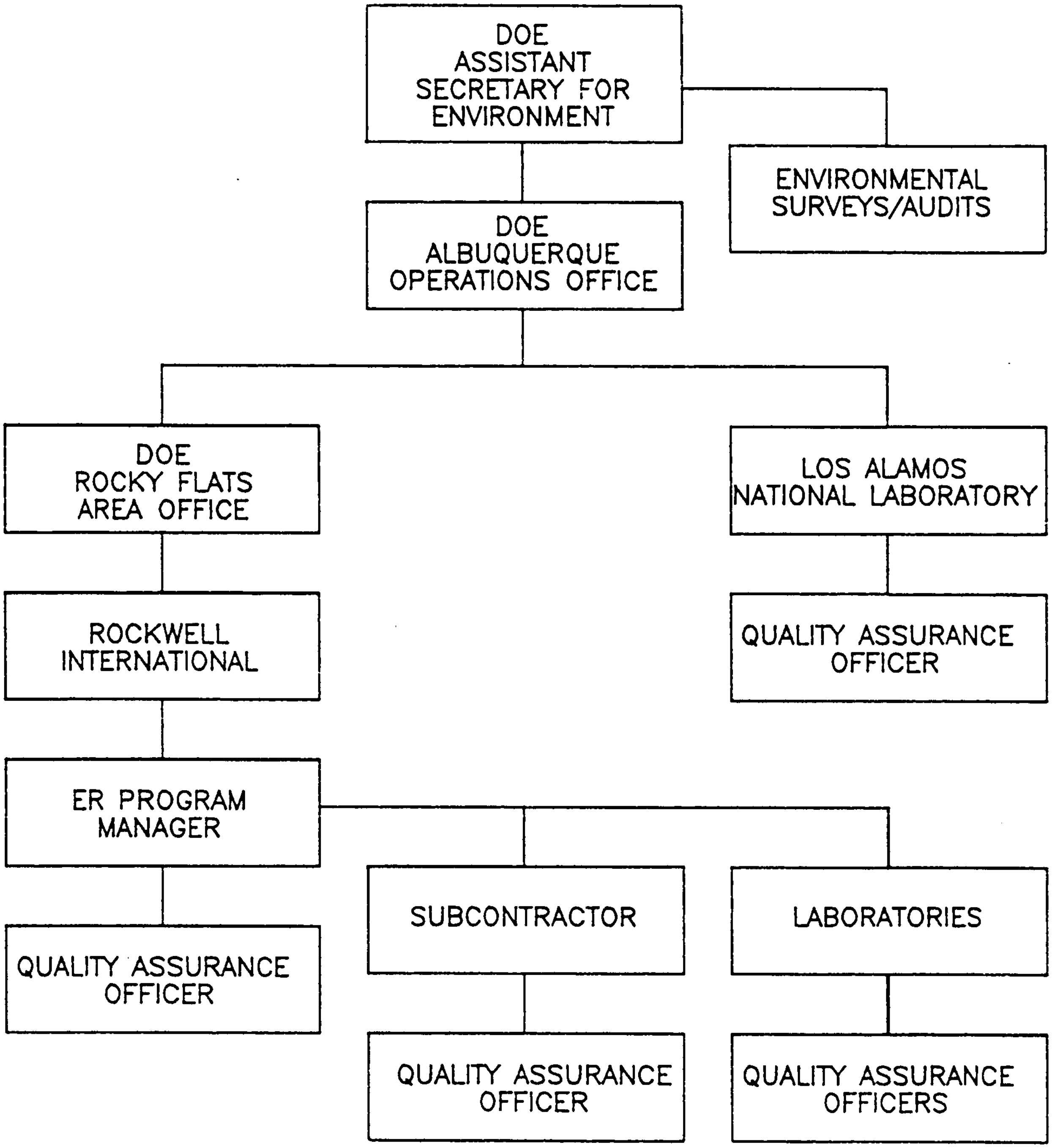
Project organization is shown in Figure 2.1. The responsibilities of the various personnel can be divided into operational, laboratory, and quality assurance responsibilities, as follows.

2.1. OPERATIONAL RESPONSIBILITIES

Assistant Secretary for the Environment. The DOE Assistant Secretary for the Environment appoints Headquarters investigation boards and establishes the scope of Headquarters investigations (DOE Order 5484.1). DOE-wide Environmental Surveys and Audits originate from the Assistant Secretary.

Environmental Surveys and Audits. Headquarters Environmental Survey Teams have been directed to conduct one-time environmental surveys and sampling of DOE facilities. These surveys are independent of ER Program activities at Rocky

FIGURE 2.1.
QUALITY ASSURANCE/QUALITY CONTROL
ORGANIZATION CHART



Flats plant, but data from survey team sampling will be utilized in the ER Programcharacterization of Rocky Flats Plant. A Headquarters environmental survey team visited the Rocky Flats Plant site in 1986. The results of the survey will be used as an internal management tool by the Secretary and Undersecretary of DOE.

Audits are a function of the Office of the Assistant Secretary for the Environment. Audit teams provide quality control for the implementation of environmental monitoring at DOE facilities. Although independent of the ER Program, audit teams complement ER Program activities by providing additional quality assurance.

DOE-Albuquerque Operations Office Environmental Programs Branch. The DOE-Albuquerque Operations Office, Environmental Programs Branch, is responsible for overseeing all environmental programs within DOE-Albuquerque Operations and conducting special assessments such as CEARP.

DOE-Rocky Flats Area Office. The DOE Rocky Flats Area Office is responsible for the missions of the Rocky Flats Plant, including environmental protection. The DOE Rocky Flats Area Office oversees the integration of Rocky Flats Plant resources with ER Program activities at Rocky Flats Plant.

Rockwell International. Rockwell International, as prime contractor to DOE, provides support to DOE in accomplishing the mission of Rocky Flats Plant, including environmental protection. Rockwell International will perform the ER Program Phase 2b site characterizations (remedial investigations) at Rocky Flats Plant.

Los Alamos National Laboratory. Los Alamos National Laboratory manages the ER program, providing direction, oversight and review, and preparing final reports.

2.2. ANALYTICAL LABORATORY RESPONSIBILITIES

Analytical laboratory services will be arranged by Rockwell International. The Rockwell laboratory facilities may be used or contracts may be made with commercial laboratories. Participation of a commercial laboratory is contingent upon acceptance of the laboratory's quality assurance program.

2.3. QA RESPONSIBILITY

Quality assurance responsibilities are to monitor and review the procedures used to perform all aspects of site characterizations (remedial investigations), including data collection, analytical services, data analysis, and report preparations. Primary responsibility for project quality rests with the Rockwell International ER Program Manager. Ultimate responsibility for project quality rests with DOE. The ER Program Manager will designate a Quality Assurance Officer who will be responsible for QA of field and analytical data.

3. QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall quality assurance objective is to implement procedures for field sampling, field testing, chain of custody, laboratory analysis, and reporting that will assure quality as specified in DOE orders governing quality assurance and environmental protection and as required for groundwater monitoring programs in 40 CFR 264 Subpart F and 265 Subpart F. Specific procedures to be used for sampling, chain-of-custody, audits, preventive maintenance, and corrective actions are described in the appropriate sections of this QA/QC Plan and the Standard Operations Procedures (SOPs). The purpose of this appendix is to define quality assurance goals for accuracy; precision and sensitivity of analysis; and completeness, representativeness, and comparability of measurement data from all analytical laboratories and field measurements.

For some field activities, samples will not be collected, but measurements will be taken where quality assurance concerns are appropriate (e.g., field measurements of pH, temperature, and elevations). The primary quality assurance objective during field measurement activities is to obtain reproducible measurements to a degree of accuracy consistent with their intended use and to document measurement procedures.

3.1. REGULATORY AND LEGAL REQUIREMENTS

Data objectives are to obtain complete, accurate, precise and representative data to use in evaluating groundwater quality at regulated units for RCRA detection and compliance programs (40 CFR Part 264) and RCRA assessment and alternative programs (40 CFR Part 265). Data will also be used in evaluating soil, surface water, and groundwater quality at Solid Waste Management Units investigated under CERCLA. The State of Colorado Department of Health (CDH) has RCRA regulatory authority over the ground- water protection program for the regulated units. EPA has ultimate authority over the CERCLA investigations although there will be state participation.

Specific RCRA and CERCLA regulatory requirements for quality assurance are identified in 40 CFR Parts 190 to 399. RCRA requirements for ground-water well installation, sample collection, and sample analysis are found in 40 CFR 264.97, 265.91, and 265.92. These requirements are included in the SOPs and this QA/QC Plan. For Fund-financed CERCLA sites, sampling must conform to a written quality assurance/site sampling plan (40 CFR 300.68 (k)). Although the Rocky Flats Plant is not a Fund-financed site, the elements of the plan identified in 40 CFR 300.68(k) are included in this QA/QC plan, the SOPs, and the sampling plan for this program. These elements are as follows:

(i) A description of the objectives of the sampling efforts with regard to both the phase of the sampling and the ultimate use of the data;

(ii) Sufficient specification of sampling protocol and procedures;

(iii) Sufficient sampling to adequately characterize the source of the release, likely transport pathways, and/or potential receptor exposure;

(iv) Specifications of the types, locations, and frequency of samples taken, taking into account the unique properties of the site, including the appropriate hydrological, geological, hydrogeologial, physiographical, and meteorological properties of the site.

3.2. LEVEL OF QUALITY ASSURANCE EFFORT

Field duplicates, field blanks, and trip blanks will be taken and submitted to the analytical laboratories to provide a means to assess data quality resulting from field sampling. Duplicate samples will be analyzed to evaluate variance due to sampling error. Field and trip blanks will be analyzed to check for procedural contamination and/or ambient site conditions that result in sample contamination. Trip blanks will be analyzed to check for contamination during packaging and shipment. Field blanks are attempts to duplicate sampling conditions with clean water. When sampling equipment, such as a bailer is used, a field blank is obtained by rinsing water through the sampling equipment and into the sample bottle. The actual number of field QA samples taken will be determined by the Quality Assurance Officer. Table 3-1 will serve as a guideline for this determination. Field QA samples will be designated with a sample number that does not indicate that they are QA samples. For laboratory analysis, matrix spikes and matrix spike duplicates are used. The general level of quality assurance effort for organic analysis will be one matrix spike and one matrix spike duplicate prepared for every 20 samples of similar concentration and/or similar sample matrix, whichever is greater. In addition, water samples of known concentration traceable to either EPA or NBS standards will be prepared for inorganic and radiological analyses. The general level of quality assurance effort for inorganic analyses will be one duplicate known sample and one duplicate field sample for every 10 investigative samples to check analytical reproducibility.

Soil samples selected for geotechnical testing will include one field duplicate for each 20 analyses being performed, if possible, but will not include blanks.

The ground-water, surface water, and soil samples collected at Rocky Flats Plant during the ER Program Phase 2 will be analyzed using the analytical methods specified in Tables 3-2, 3-3, 3-4 and 3-5. The laboratory level quality assurance procedures, blanks, spikes, as well as calibration procedures are specified in each of the referenced methods.

3.3. ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES

The fundamental quality assurance objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the quality control acceptance criteria of the analytical protocols. Sensitivities required for analyses of radionuclides,

TABLE 3-1

GUIDELINES FOR QA/QC SAMPLES
FOR FIELD SAMPLING PROGRAMS
FOR SOILS, SEDIMENTS, AND WATER

Analyte	Duplicates	Field Blank	Trip Blank
TCL Volatiles	1 in 20	1 in 20	1 per day of sampling
TCL metals an organics (excluding volatiles)	1 in 20	1 in 20	
Radionuclides	1 in 20	1 in 20	
Other Inorganics	1 in 20		

NOTE: Trip blanks and field blanks will be prepared with distilled/deionized organic free laboratory water for solids and aqueous samples.

TABLE 3-2

ANALYSIS PLAN FOR AQUEOUS SAMPLES[a]

Analyte	Method	Detection Limit	Sample Container	Sample Volume	Preservations	Holding Time (days)	Reporting Units
TCL volatile	EPA 8240[b]	x[e]	40-ml vial (2) w/Teflon-lined silicon rubber septum	40 ml	$4^{\circ}C$[j]	14	ug/l
TCL base/neutral/acid[c]	EPA 8270	x[e]	1-liter amber glass	1 l	$4^{\circ}C$	7/40[i]	ug/l
TCL pesticide/PCB	EPA 8080	x[e]	1-liter amber glass	1 l	$4^{\circ}C$	7/40[i]	ug/l
TCL inorganic	EPA 6000 - 7000 series	x[e]	1-liter plastic with NO_3	1 l	pH<2,w/HN_3[k]	180	mg/l
Non-TCL metals[d]	EPA 6000 - 7000 series	x[e]	1-liter plastic with NO_3	1 l	pH<2,w/HN_3[k]	180	mg/l
Cyanide	EPA 9010	x[e]	1-liter glass with NaOH	0.5 l	pH>11,w/NaOH	14	mg/l
pH[f]	EPA 9840	0.1 pH unit	500-ml plastic	N/A	None	Field meas.	pH unit
Specific Conductivity[f]	EPA 9050	1	500-ml plastic	N/A	None	Field meas.	umho/cm
Temperature[f]	EPA 9050	0.1	500-ml plastic	N/A	None	Field meas.	$^{\circ}C$
Dissolved Oxygen[f]	EPA 9050	0.5	500-ml plastic	N/A	None	Field meas.	mg/l
TDS	EPA 160.1[j]	5	500-ml plastic	0.250 l	$4^{\circ}C$	7	mg/l
TSS	EPA 160.2[j]	10	500-ml plastic	0.250 l	$4^{\circ}C$	7	mg/l
Total phosphate	EPA 365.2[j]	0.01	500-ml glass with H_2SO_4 until pH<2	0.50 l	$4^{\circ}C$,pH<2 w/H_2SO_4	28	mg/l
Chloride, sulfate	EPA 9251 EPA 9038	5	500-ml plastic	1 l	$4^{\circ}C$[k]	28	mg/l

TABLE 3-2 (Continued)
ANALYSIS PLAN FOR AQUEOUS SAMPLES[a]

Analyte	Method	Detection Limit	Sample Container	Sample Volume	Preservations	Holding Time (days)	Reporting Units
Carbonate/bicarbonate[g]	S.M. 403[h]	10	500-ml plastic	1 l	4°C[k]	14	mg/l
Nitrate	EPA 300[j]	5	500-ml plastic	1 l	4°C[k], pH<2 w/H_2SO_4	28	mg/l
Hexavalent chromium	S.M. 312B[h]	0.01	500-ml plastic	1 l	4°C[k]	1	mg/l

TCL - Target Compound List
N/A - not applicable
TDS - total dissolved solids
TSS - total suspended solids
[a] The sampling plans will define the actual suite of parameters to be analyzed for specific samples.
[b] Test Methods for Evaluating Solid Wastes; SW-846, November 1986
[c] The TCL base/neutral/acid fractions analytical parameters are the HSL semivolatiles.
[d] Includes cesium, molybdenum, and strontium, which are non-TCL metals.
[e] See Tables 3-6 and 3-7.
[f] Field measurements
[g] These are reported as carbonate and bicarbonate alkalinity.
[h] Standard Methods for Examination of Water and Wastewater, 16th Edition.
[i] Extraction within 7 days, analysis within 40 days of extraction.
[j] Methods for Chemical Analysis of Water and Wastes, 1983; EPA 600/4-79-020.
[k] Sampling Plan may specify filtered sample. Sampling will be done in field within 2 hours of sample collection: preservatives added after filtering.

TABLE 3-3
ANALYSIS PLAN FOR SOIL/SEDIMENT/WASTE SAMPLES[a]

Analyte	Method	Detection Limit	Sample Container	Sample Volume (g)	Preservations	Holding Time (days)	Reporting Units
TCL volatile	EPA 8240	x[d]	40-ml vial (2) w/Teflon-lined silicon rubber septum	5	$4^{\circ}C$	14	ug/kg[f]
TCL base/neutral/acid	EPA 8270	x[d]	1-liter amber glass	10-30	$4^{\circ}C$	7/40	ug/kg[f]
TCL Pesticide/PCB	EPA 8080	x[d]	1-liter amber glass	10-30	$4^{\circ}C$	7/40[e]	ug/kg[f]
TCL inorganic	EPA 7000 & 6010 series	x[d]	1-liter plastic with NO_3	200	$4^{\circ}C$	180	mg/kg[f]
Non-TCL metals[c]	EPA 7000 & 6010 series	x[d]	1-liter plastic with NO_3	200	$4^{\circ}C$	180	mg/kg[f]
Reactivity	EPA 9010 and 9030	Ref. b	1-liter amber glass	---	$4^{\circ}C$	N/A	ug/l
Chloride	EPA 9251	60 u/g[h]	500-ml plastic	20	$4^{\circ}C$	N/A	mg/kg[f]
Sulfate	EPA 9038	60 ug/g[h]	500-ml plastic	20	$4^{\circ}C$	N/A	mg/kg[f]
Nitrate	EPA 353.1[g]	60 ug/g[h]	500-ml plastic	20	$4^{\circ}C$	N/A	mg/kg[f]
Cyanide	EPA 9010	x[d]	1-liter glass with NaOH	200	$4^{\circ}C$	14	mg/kg[f]
Hexavalent chromium	S.M. 312B[i]	1 ug/g[h]	500-ml plastic	100	$4^{\circ}C$	1	mg/kg[f]

TCL - Target Compound List
N/A - not applicable
[a] The sampling plans will define the actual suite of parameters to be analyzed for specific samples.
[b] Test methods for evaluating solid wastes: SW-846, November 1986
[c] Includes cesium, molybdenum, and strontium, which are non-TCL metals.
[d] See Tables 3-6 and 3-7.
[e] Extract within 7 days, analysis within 40 days of extraction.
[f] Reported as dry weight, percent moisture reported separately.
[g] Soil/sediments will be leached with laboratory reagent water (20 g soil to 50 ml water) and the water extract will be analyzed using procedure in "Methods for Chemical Analysis of Water and Wastes," 1983; EPA 600/4-79-020.
[h] These are estimated detection limits.
[i] Soil/sediment will be leached with laboratory reagent water (5 g soil and 100 ml of water) by shaking for 2 hours, and the water extract filtered and subsequently analyzed. This is in accordance with method 312B in Standard Methods for Examination of Water and Wastewater, 16th Edition.

TABLE 3-4
PLAN FOR RADIOLOGICAL ANALYSIS OF AQUEOUS SAMPLES

Analyte	Method[a]	Detection Limit[b]	Sample Container	Sample Volume	Preservations	Holding Time (days)	Reporting Units
Gross alpha/beta	1,2,3,4,6, 7,8,9	Gross a = 2 pCi/l Gross b = 4 pCi/e	1-gallon plastic[c] w/Teflon-lined	0.2 l	HNO_3 to pH<2	180	pCi/l
Tritium	1,2,3,8	400 pCi/l	100-ml glass	0.008 l	No preservation	None	pCi/l
Plutonium-239	10,11	0.3 pCi/l	1-gallon plastic[c]	1.000 l	HNO_3 to pH<2	180	pCi/l
Americium-241	11,12	0.4 pCi/l	1-gallon plastic[c]	1.000 l	HNO_3 to pH<2	180	pCi/l
Isotopic Uranium	1,3,4,7,8,9	U-233,234 = 0.6 pCi/l U-238 = 0.6 pCi/l	1-gallon plastic[c]	0.500 l	HNO_3 to pH<2	180	pCi/l
Strontium-90	1,3,4,8	1 pCi/l	1-gallon plastic[c]	1.000 l	HNO_3 to pH<2	180	pCi/l

N/A - not applicable
HNO_3 - nitric acid
U - uranium
[a] - See Notes
[b] - See Notes
[c] - Aliquots for radiochemical analysis, with the exception of tritium, will come from the same sample container.

Table 3-4 Continued
Radiological Analysis - Method References
NOTES

1. U.S. Environmental Protection Agency, 1979, Radiochemical Analytical Procedures for Analysis of Environmental Samples, Report No. EMSL-LY-0539-1, Las Vegas, NV, U.S. Environmental Protection Agency.

2. American Public Health Association, American Water Works Association, Water Pollution Control Federation, 1985. Standard Methods for the Examination of Water and Wastewater, 16th ed., Washington, D.C., Am. Public Health Association.

3. U.S. Environmental Protection Agency, 1976. Interim Radiochemical Methodology for Drinking Water, Report No. EPA-600/4-75-008. Cincinnati U.S. Environmental Protection Agency.

4. Harley, J. H., ed., 1975, HASL Procedures Manual, HASL-300; Washington, D.C., U.S. Energy Research and Development Administration.

5. Misaqi, Fazlelleh L., Monitoring Radon-222 Content of Mine Waters Informational Report 1026, U.S. Department of Interior, Mining Enforcement and Safety Administration, Denver, CO, 1975.

6. "Radioassay Procedures for Environmental Samples," 1967, USDHEW, Section 7.2.3.

7. "Handbook of Analytical Procedures," USAEC, Grand Junction Lab. 1970, page 196.

8. "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032, August 1980, Environmental Monitoring and Support Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio 45268.

9. "Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," U.S.G.S. Book 5, Chapter A5, 1977.

10. "Acid Dissolution Method for the Analysis of Plutonium in Soil," EPA-600/7-79-081, March 1979, U.S. EPA Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 1979.

11. "Procedures for the Isolation of Alpha Spectrometrically Pure Plutonium, Uranium and Americium," by E. H. Essington and B. J. Drennon, Los Alamos National Laboratory, a private communication.

12. "Isolation of Americium from Urine Samples," Rocky Flats Plant, Health, Safety, and Environmental Laboratories.

Table 3-4 (continued)

NOTES
Lower Limits of Detection

The detection limits presented were calculated using the formula in N.R.C. Regulatory Guide 4.14, Appendix Lower Limit of Detection, pg. 21, and follow:

$$LLD = \frac{4.66\ (BKG)^{1/2}}{(2.22)\ (Eff)\ (CR)\ (SR)\ (e\text{-}xt)\ (Aliq)}$$

Where

LLD	=	Lower Limit of Detection in pCi per sample unit
BKG	=	Instrument Background in counts per minute (cpm)
Eff	=	Counting efficiency in cpm/disintegration per minute (dpm)
CR	=	Fractional radiochemical yield
SR	=	Fractional radiochemical yield of a known solution
x	=	The radioactive decay constant for the particular radionuclide
t	=	The elapsed time between sample collection and counting.
ALIQ	=	Sample Volume

In that LLD is a function of many variables including sample matrix, sample volume, and other factors, the limits presented are only intended as guides to order-of-magnitude sensitivities and, in practice, can easily change by a factor of two or more even for the conditions specified.

TABLE 3-5
PLAN FOR RADIOLOGICAL ANALYSIS OF SOILS/SEDIMENTS

Analyte	Method[a]	Detection Limit[b]	Sample Container	Sample Volume	Preservations	Holding Time (days)	Reporting Units
Gross alpha/beta	1,2,3,4,6, 7,8,9	Gross a = 4 pCi/l		0.1	N/A	N/A	pCi/g
		Gross b = 10 pCi/g	1-liter glass[c]				
Plutonium-239	10,11	0.3 pCi/g	1-liter glass[c]	N/A	N/A	pCi/g	
Americium-241	11,12	0.3 pCi/g	1-liter glass[c]	1	N/A	N/A	pCi/g
Isotopic Uranium	1,3,4,7,8,9	U-233,234 = 0.3 pCi/g	1-liter glass[c]	1	N/A	N/A	pCi/g
		U-238 = 0.3 pCi/g					
Strontium-90	1,3,4,8	1 pCi/g	1-liter glass [c]	1	N/A	N/A	pCi/g

U - Uranium
N/A - not applicable
U - uranium
[a] - See Notes, Table 3-4.
[b] - See Notes, Table 3-4.
[c] - Aliquots for radiochemical analysis will come from the same container.

organics, metals, and other inorganic compounds, in both aqueous and solid matrices will be the detection limits shown in Tables 3-4 through 3-7. Achieving these detection limits depends on the sample matrix. Highly contaminated samples requiring dilution will have detection limits higher than those listed.

The geotechnical and field data will be considered accurate if the quality assurance criteria with respect to equipment, solutions, and calculations are met, and if adherence to appropriate methods can be documented during a systems audit.

3.4. COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

The laboratories will provide data meeting quality control acceptance criteria as described in the specified method. For the Target Compound List (TCL) constituents, these criteria are defined by the Contract Laboratory Program (CLP) Statement of Work (SOW) for organics (EPA, 1987a) and inorganics (EPA, 1987b). Acceptance criteria for surrogate and matrix spike recovery limits are shown in Tables 3-8 and 3-9. Laboratories will provide a case narrative comparing QA results with method control limits.

3.5. FIELD MEASUREMENTS

Measurement data will be generated in many field activities. These activities may include, but are not limited to, the following:

- using geophysical surveys
- documenting time and weather conditions
- locating and determining the elevation of sampling stations
- measuring pH, conductivity, and temperature of groundwater samples
- qualitative organic vapor screening of solid samples using a photoionization detector (PID) or an organic vapor analyzer (OVA)
- measuring water levels in a borehole or well

Table 3-6 Target Compound (TCL) and Required Detection Limits (RDL)**

Volatiles	CAS Number	Detection Limits* Low Water[a] ug/L	Low Soil/Sediment[b] ug/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	6	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-01	5	5
8. 1,1-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-35-3	5	5
10. trans-1,2-Dichloroethene	156-60-5	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,1,2,2-Tetrachloroethane	79-34-5	5	5
19. 1,2-Dichloropropane	78-87-5	5	5
20. trans-1,3-Dichloropropene	100061-02-6	5	5
21. Trichloroethene	79-01-6	5	5
22. Dibromochloromethane	124-48-1	5	5
23. 1,1,2-Trichloroethane	79-00-5	5	5
24. Benzene	71-43-2	5	5
25. cis-1,3-Dichloropropene	10061-01-5	5	5
26. 2-Chloroethyl Vinyl Ether	110-75-8	10	10
27. Bromoform	75-25-2	5	5
28. 2-Hexanone	591-78-6	10	10
29. 4-Methyl-2-pentanone	108-10-1	10	10
30. Tetrachloroethene	127-18-4	5	5
31. Toluene	108-88-3	5	5
32. Chlorobenzene	108-90-7	5	5
33. Ethyl Benzene	100-41-4	5	5
34. Styrene	100-42-5	5	5
35. Total Xylenes	100-42-5	5	5

Table 3-6 (Continued)

Semi-Volatiles	CAS Number	Detection Limits* Low Water[c] ug/L	Low Soil/Sediment[d] ug/Kg
36. N-Nitrosodimethylamine	62-75-9	10	330
37. Phenol	108-95-2	10	330
38. Aniline	62-53-3	10	330
39. bis(2-Chloroethyl) ether	111-44-4	10	330
40. 2-Chlorophenol	95-57-8	10	330
41. 1,3-Dichlorobenzene	541-73-1	10	330
42. 1,4-Dichlorobenzene	106-46-7	10	330
43. Benzyl Alcohol	100-51-6	10	330
44. 1,2-Dichlorobenzene	95-50-1	10	330
45. 2-Methylphenol	95-48-7	10	330
46. bis(2-Chloroisopropyl ether	39638-32-9	10	330
47. 4-Methylphenol	106-44-5	10	330
48. N-Nitroso-Dipropylamine	621-64-7	10	330
49. Hexachloroethane	67-72-1	10	330
50. Nitrobenzene	98-95-3	10	330
51. Isophorone	78-59-1	10	330
52. 2-Nitrophenol	88-75-5	10	330
53. 2,4-Dimethylphenol	105-67-9	10	330
54. Benzoic Acid	65-85-0	50	1600
55. bis(2-Chloroethoxy) methane	111-91-1	10	330
56. 2,4-Dichlorophenol	120-83-2	10	330
57. 1,2,4-Trichlorobenzene	120-82-1	10	330
58. Naphthalene	91-20-1	10	330
59. 4-Chloroaniline	106-47-8	10	330
60. Hexachlorobutadiene	87-68-3	10	330
61. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
62. 2-Methylnaphthalene	91-57-6	10	330
63. Hexachlorocyclopentadiene	77-47-4	10	330
64. 2,4,6-Trichlorophenol	88-06-2	10	330
65. 2,4,5-Trichlorophenol	95-95-4	50	1600
66. 2-Chloronaphthalene	91-58-7	10	330
67. 2-Nitroaniline	88-74-4	50	1600
68. Dimethyl Phthalate	131-11-3	10	330
69. Acenaphthylene	208-96-8	10	330
70. 3-Nitroaniline	99-09-2	50	1600

Table 3-6 (Continued)

Semi-Volatiles	CAS Number	Detection Limits* Low Water[c] ug/L	Low Soil/Sediment[d] ug/Kg
71. Acenaphthene	83-32-9	10	330
72. 2,4-Dinitrophenol	51-28-5	50	1600
73. 4-Nitrophenol	100-02-7	50	1600
74. Dibenzofuran	132-64-9	10	330
75. 2,4-Dinitrotoluene	121-14-2	10	330
76. 2,6-Dinitrotuluene	606-20-2	10	330
77. Diethylphthalate	84-66-2	10	330
78. 4-Chlorophenyl Phenyl ether	7005-72-3	10	330
79. Fluorene	86-73-7	10	330
80. 4-Nitroaniline	100-01-6	50	1600
81. 4,6-Dinitro-2-methyl-phenol	534-52-1	50	1600
82. N-nitrosodiphenylamine	86-30-6	10	330
83. 4-Bromophenyl Phenyl ether	101-55-3	10	330
84. Hexachlorobenzene	118-74-1	10	330
85. Pentachloropphenol	87-86-5	50	1600
86. Phenanthrene	85-01-8	10	330
87. Anthracene	120-12-7	10	330
88. Di-n-butylphthalate	84-74-2	10	330
89. Fluoranthene	206-44-0	10	330
90. Benzidine	92-87-5	50	1600
91. Pyrene	129-00-0	10	330
92. Butyl Benzyl Phthalate	85-68-7	10	330
93. 3,3'-Dichlorobenzidine	91-94-1	20	660
94. Benzo(a)anthracene	56-55-3	10	330
95. bis(2-ethylhexyl) phthalate	117-81-7	10	330
96. Chrysene	218-01-9	10	330
97. Di-n-octyl Phthalate	117-84-0	10	330
98. Benzo(b)fluoranthene	205-99-2	10	330
99. Benzo(k)fluoranthene	207-08-9	10	330
100. Benzo(a)pyrene	50-32-8	10	330
101. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
102. Dibenz(a,h)anthracene	53-70-3	10	330
103. Benzo(g,h,i)perylene	191-24-2	10	330

Table 3-6 (Continued)

Pesticides	CAS Number	Detection Limits* Low Water[c] ug/L	Low Soil/Sediment[f] ug/Kg
104. alpha-BHC	319-84-6	0.05	8.0
105. beta-BHC	319-85-7	0.05	8.0
106. delta-BHC	319-86-8	0.05	8.0
107. gamma-BHC (Lindane)	58-89-9	0.05	8.0
108. Heptachlor	76-44-8	0.05	8.0
109. Aldrin	309-00-2	0.05	8.0
110. Heptachlor Epoxide	1024-57-3	0.05	8.0
111. Endosulfan I	959-98-8	0.05	8.0
112. Dieldrin	60-57-1	0.10	16.0
113. 4,4'-DOE	72-55-9	0.10	16.0
114. Endrin	72-20-8	0.10	16.0
115. Endosulfan II	33213-65-9	0.10	16.0
116. 4,4'-DDD	72-54-8	0.10	16.0
117. Endrin Aldehyde	7421-93-4	0.10	16.0
118. Endosulfan Sulfate	1031-07-8	0.10	16.0
119. 4,4-'DDT	50-29-3	0.10	16.0
120. Endrin Ketone	53494-70-5	0.10	16.0
121. Methoxychlor	72-43-5	0.5	80.0
122. Chlordane	57-74-9	0.5	80.0
123. Toxaphene	8001-35-2	1.0	160.0
124. AROCLOR-1016	12674-11-2	0.5	80.0
125. AROCLOR-1221	11104-28-2	0.5	80.0
126. AROCLOR-1232	11141-16-5	0.5	80.0
127. AROCLOR-1242	53469-21-9	0.5	80.0
128. AROCLOR-1248	12672-29-6	0.5	80.0
129. AROCLOR-1254	11097-69-1	1.0	160.0
130. AROCLOR-1260	11096-82-5	1.0	160.0

[a]Medium Water Required Detection Limits (RDL) for Volatile TCL Compounds are 100 times the individual Low Water RDL.
[b]Medium Soil/Sediment Required Detection Limits (RDL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment RDL.
[c]Medium Water Required Detection Limits (RDL) for Semi-Volatile TCL Compounds are 100 times the individual Low Water RDL.
[d]Medium Soil/Sediment Required Detection Limits (RDL) for Semi-Volatile TCL Compounds are 60 times the individual Low Soil/Sediment RDL.

Table 3-6 (Continued)

[c]Medium Water Required Detection Limits (RDL) for Pesticide TCL Compounds are 100 times the individual Low Water RDL.
[f]Medium Soil/Sediment Required Detection Limits (RDL) for Pesticide TCL compounds are 60 times the individual Low Soil/Sediment RDL.

*Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.
**These are the EPA detection limits under the Contract Laboratory Program. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

TABLE 3-7

TCL METALS AND OTHER INORGANICS
NOMINAL DETECTION LIMITS
REQUIRED BY THE CONTRACT LABORATORY PROGRAM

Element	Nominal Detection Limit[1,2] Water (ug/l)	Soil (mg/kg)
Aluminum	200	200
Antimony	60	60
Arsenic	10	10
Barium	200	200
Beryllium	5	5
Cadmium	5	5
Calcium	5000	5000
Chromium	10	10
Cobalt	50	50
Copper	25	25
Iron	100	100
Lead	5	5
Magnesium	5000	5000
Manganese	15	15
Mercury	0.2	0.2
Nickel	40	40
Potassium	5000	5000
Selenium	5	5
Silver	10	10
Sodium	5000	5000
Thallium	10	10
Vanadium	50	50
Zinc	20	20
Cesium	200	200
Molybdenum	40	40
Strontium	200	200
Cyanide	10	10

1 Higher detection levels may also be used in the following circumstances.

- If the sample concentration exceeds two times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the nominal detection limit. This is illustrated in the example below:

  For lead:

  Method in use - ICP
  Instrument Detection Limit (IDL) = 40
  Sample Concentration = 85
  Nominal Detection Limit (CRDL) = 5

  The value of 85 may be reported even though instrument detection limit is greater than nominal detection level. The instrument or method detection limit must be documented.

2 The given detection limits are the instrument detection limits obtained in pure water using the procedures given in Tables 3-2 and 3-3. The detection limits for samples may be considerably higher depending on the sample matrix.

TABLE 3-8

QUALITY ASSURANCE OBJECTIVES OF ACCURACY
FOR ORGANIC SURROGATE ANALYSES[a]

Fraction	Surrogate Compound	Recovery Limits Low/Medium Water	Low/Medium Soil/Sediment
VOA	Toluene-d8	88-100	81-117
VOA	4-Bromofluorobenzene	86-115	74-121
VOA	1,2-Dichloroethane-d4	76-114	70-121
BNA	Nitrobenzene-d5	35-114	23-120
BNA	2-Fluorobiphenyl	43-116	30-115
BNA	p-Terphenyl-d14	33-114	18-137
BNA	Phenol-d5	10-94	24-113
BNA	2-Fluorophenol	21-100	25-121
BNA	2,4,6-Tribromophenol	10-123	19-122
Pesticides	Dibutylchlorendate	24-154[b]	20-150[b]

VOA - Volatile organics analysis
BNA - Base/neutral, acid

[a] US EPA SOW 10/86 as revised 8/87.
[b] These recoveries are advisory only.

TABLE 3-9

QUALITY ASSURANCE OBJECTIVES OF ACCURACY AND PRECISION OF ORGANIC TARGET COMPOUND LIST ANALYSES[a]

Fraction	Matrix Spike Compound	Recovery Limits Water	Recovery Limits Soil/Sed.	% RPD Limits Water	% RPD Limits Soil/Sed.
VOA	1,1Dichloroethene	61-145	59-172	14	22
VOA	Trichloroethene	71-120	62-137	14	24
VOA	Chlorobenzene	75-130	60-133	13	21
VOA	Toluene	76-125	59-139	13	21
VOA	Benzene	76-127	66-142	11	21
BN	1,2,4-Trichlorobenzene	39-98	38-107	29	23
BN	Acenaphthene	46-118	31-137	31	19
BN	2,4-Dinitroroluene	24-96	28-89	38	47
BN	Pyrene	26-127	35-142	31	36
BN	N-nitroso-di-n-propylamine	41-116	41-126	38	38
BN	1,4-Dichlorobenzene	36-97	28-104	28	27
Acid	Pentachlorophenol	9-103	17-109	50	47
Acid	Phenol	12-189	26-90	42	35
Acid	2-Chlorophenol	27-123	25-102	40	50
Acid	4-Chloro-3-methol-phenol	23-97	26-103	40	50
Acid	4-Nitrophenol	10-80	11-114	50	50
Pest.	Lindane	56-123	46-127	15	50
Pest.	Heptachlor	40-131	35-130	20	31
Pest.	Aldrin	40-120	34-132	22	43
Pest.	Dieldrin	56-126	31-134	18	38
Pest.	Endrin	56-121	42-139	21	45
Pest.	4,4-DDT	38-127	23-134	27	50
PCB	Arochlor 1254	Not Established		30	50

[a] US EPA SOW 10/86 as revised 8/87

RPD - Relative percent difference

VOA - Volatile organic analysis

BNA - Base/neutral, acid

Acid - Acid

Pest.- Pesticide

- standard penetration testing
- calculating pumping rates
- measuring well-development and presampling purge volumes
- conductivity tests

The general quality assurance objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data through the documented use of standardized procedures. Procedures for performing these activities and standardized formats for documenting them are presented in other sections of this document. These procedures may be incorporated by reference (EPA methods) or included as appendices. Standardized formats for documenting data collection are specified in the sampling plans.

4. CALIBRATION PROCEDURES AND FREQUENCY

Calibration of equipment used to perform geotechnical testing will be in accordance with that specified in the ASTM Method D 422-63 for hydrometer and sieve analyses (Annual Book of ASTM Standards, Volume 04.08, 1984). The equipment calibrations, including those for ovens, thermometers and balances, shall be done at a minimum of every six months and prior to large scale testing.

A calibration log book will be assigned to each field instrument, and all calibrations will be documented in the log books. Calibrations of field instruments during sampling will be logged in the field notebook. Laboratory calibration of field instruments will be performed at a minimum of every six months and logged in the equipment maintenance logbook. In general, calibration procedures will follow the instructions given by the manufacturer. The instrument's manual will be available to the operator.

5. DATA REDUCTION, VALIDATION, AND REPORTING

Analytical laboratories will provide results to the Rockwell International ER Program Manager, the Subcontractor Project Manager, and Quality Assurance Officers. These data will include results and documentation for laboratory blanks and duplicates, matrix spikes, and calibration check standards as required by specified analytical methods.

Analytical data, including quality control sample analysis, will be entered into the technical data base. The analyses will be grouped into lots, with quality control samples associated with a particular lot. The analyses of quality control samples will be compared to theoretical known concentrations of those samples. If analyses do not meet acceptance criteria, the analytical laboratory may be asked to re-analyze the samples for parameters which do not exceed holding times. Analyses which cannot meet acceptance criteria, will be labelled as unacceptable. All parameter-specific values for a lot in which the quality control analyses did not meet acceptance criteria, will be flagged as such.

Analytical reports from a field laboratory, if used, and the geotechnical laboratory will include all raw data, documentation of reduction methods, and related quality assurance/quality control data. These data will be assessed by verification of reduction results and confirmation of compliance with quality assurance/quality control requirements.

Raw data from field measurements and sample collection activities used in project reports will be appropriately identified. Where data have been reduced or summarized, the method of reduction will be documented.

The Quality Assurance Officers will review results of Quality Control-acceptance evaluations and will document acceptance or non-acceptance of data. The Quality Assurance Officers will maintain records of quality control-acceptance tests. These records will be subject to independent audit, which may include Los Alamos National Laboratory.

6. INTERNAL QUALITY CONTROL PROCEDURES

Internal quality control procedures for the laboratory are those specified in this QA/QC Plan. These specifications include types of audits required (e.g., sample spikes, surrogate spikes, reference samples, controls, and blanks), frequency of audits, compounds to be used for sample spikes and surrogate spikes, quality control charts, quality control acceptance criteria for audits, instrument maintenance procedures, and participation in national laboratory comparison programs.

The quality control checks and acceptance for data from a field laboratory, if used, and the geotechnical laboratory are described in Sections 3.2, 3.3, 4.0, and 5.0. Quality control procedures for field measurements (pH, conductivity, and temperature) include checking the reproducibility of the measurement in the field by obtaining field duplicates, comparison with laboratory results, multiple readings and/or by calibrating the instruments (where appropriate). Quality control of field sampling will involve collecting field duplicates and field blanks.

7. PERFORMANCE AND SYSTEMS AUDITS

For each activity where samples are collected, a performance audit investigating conformance with quality control procedures will be conducted at the discretion of the Rockwell International ER Program Manager, Subcontractor Project Manager, and Quality Assurance Officers. This audit will be scheduled to allow oversight of as many different field activities as possible. This audit will be performed by the Quality Assurance Officers or their designees. A written report of the results of this audit, along with a notice of nonconformity (if necessary), will be submitted to the following individuals:

- Rockwell International ER Program Manager
- Subcontractor Project Manager
- Subcontractor Site Manager

At least one systems audit will be performed per year. The audit will verify that a system of quality control measures, procedures, reviews, and approvals was established for all activities and is being used by project personnel. It will also verify that the system for project documentation is being used and that all quality control records, along with required quality control reviews, approvals, and activity records are being maintained. A standard checklist for systems audits will be used. The systems audit will be conducted by the Quality Assurance Officers and/or Los Alamos National Laboratory. A final report will be prepared which summarizes any deviations from approved methods and their impacts on the project results.

After consultation with the CEARP Manager (and Subcontractor Project Manager), the Quality Assurance Officers may schedule systems audits of the participating laboratories. At a minimum, the systems audit would include inspection of laboratory notebooks, control sheets, logsheets, computer files, and equipment calibration and maintenance records. If scheduled, system audits will be executed by individuals identified in Section 2.3 of this document.

Performance and systems audits of analytical laboratories will be scheduled and executed by the laboratory Quality Assurance Officers. Documentation of a satisfactory audit by another agency may substitute for an ER Program audit.

8. PREVENTIVE MAINTENANCE

This section applies primarily to field equipment. Preventive maintenance will be addressed by checks of field equipment prior to initiation of field operations, to allow time for replacement of malfunctioning equipment. For each instrument, the Subcontractor Site Manager will be responsible for implementing and documenting these procedures on a weekly basis during the period of use. Manufacturer's instructions will be followed.

Preventive maintenance programs for laboratory instruments will be addressed in that laboratory's Quality Assurance Program.

9. LABORATORY DATA ASSESSMENT PROCEDURES

Analytical data from laboratories is assessed for accuracy, precision and completeness by the laboratory Quality Assurance Officers, using the standard procedures described below.

Assessment of data generated by analytical laboratories is initiated and continued at three administrative levels. The bench chemist directly responsible for the test knows current operating acceptance limits. He/she can directly accept or reject generated data and consult with his/her immediate supervisor for any corrective action. Once the bench chemist has reported the data as acceptable, he/she initials the report sheet. Any out-of-control results are flagged and a note is made as to why the results were reported.

The chemist receives the data sheets and reviews the quality control data that accompanied the sample run. After checking the reported data for completeness and quality control results, the chief chemist either initials the report sheet or sends it back to the analyst chemist for rerunning of samples. The Quality Control Coordinator reviews data forwarded to him/her as acceptable by the chemist. Any remaining out-of-control results that, in the opinion of the Quality Control Coordinator, do not necessitate re-running of the sample, are flagged, and a memo is written to the data user regarding utility of the data. Data generated from all analyses are given a final review by the laboratory Quality Assurance Officers.

10. CORRECTIVE ACTION PROCEDURES

The Quality Assurance Officer and the designated audit teams will prepare a report describing the results of the performance and/or system audits. If unacceptable conditions (e.g., failure to have/use procedures), unacceptable data, nonconformity with the quality control procedures, or a deficiency are identified, the Quality Assurance Officers will notify the Rockwell International ER Program Manager of the results of the audit in writing. They will also state if the nonconformity is of significance for the program and recommend appropriate corrective actions. The Rockwell International ER Program Manager will be responsible for ensuring that a corrective action plan is developed and initiated and that, if necessary, special expertise not normally available to the project team is made available. The subcontractor will be responsible for carrying out corrective actions. The subcontractor will also ensure that additional work is not performed until the nonconformity is corrected. Corrective action may include

- reanalyzing the samples if holding time permits,
- resampling and reanalyzing,
- evaluating and amending the sampling and analytical procedures, and
- accepting the data and acknowledging its level of uncertainty.

The Rockwell International ER Program Manager will be responsible for ensuring that corrective action was taken, and that it adequately addressed the nonconformity.

After corrective action is taken, the Quality Assurance Officer responsible for the audit will document its completion in a written report. The report will indicate any identified findings, corrective action taken, follow-up action, and final recommendations.

The report will be sent to the Rockwell International ER Program Manager. Project staff will be responsible for initiating reports on suspected nonconformities in field activities and deliverables or documents.

11. QUALITY ASSURANCE REPORTS

The Rockwell International ER Program Manager will rely on written reports/memoranda documenting data assessment activities, performance and systems audits, nonconformity notices, corrective action reports, and quality assurance notices to enforce quality assurance requirements. The Quality Assurance Officer will issue an annual quality assurance report.

Records will be maintained to provide evidence of quality assurance activities. Proper maintenance of quality assurance records is essential to provide support for legal proceedings and to assure overall quality of the investigation. A quality assurance records index will be started at the beginning of the project. All information received from outside sources or developed during the project will be retained by the project team. Upon termination of an individual task or work assignment, working files will be processed for storage as quality assurance records. Upon termination of the program, complete documentation records (for example, chromatograms, spectra, and calibration records) will be archived as required by DOE Order 1324.2A (Records Deposition). The Rockwell International ER Program Manager and the Los Alamos National Laboratory Quality Assurance Officer will be responsible for ensuring that the Quality Assurance records are being properly stored and that they can be retrieved.

12. REFERENCES

DOE 1986: "Comprehensive Environmental Assessment and Response Program Phase 1: Draft Installation Assessment Rocky Flats Plant," US Department of Energy unnumbered draft report, April 1986.

EPA, 1987a: Contract Laboratory Program, Statement of Work, Organic Analysis, August, 1987.

EPA, 1986: Contract Laboratory Program, Statement of Work, Inorganic Analysis, July, 1987.